

REMARKSStatus of the Claims

Claims 1-23 were pending in this application. With this amendment, the applicants are canceling claims 1-12, relating to substrates, and claims 15 and 16, relating to processes for manufacturing substrates. Claims 17 and 23 have been amended, with claim 17 having been rewritten in independent form, and claims 24-34, analogous to claims 2-12, have been added. Thus, claims 13, 14, and 17-34 are the pending claims in this application, and the Independent claims are: Claim 13 directed to a composite membrane and claim 17 directed to a process for the manufacture of a membrane.

Summary of the Office Action

In the Office Action dated December 5, 2002, the application was objected to because it does not contain an abstract of the disclosure as required by 37 CFR 1.72(b). Claims 6, 7, 8, and 23 were rejected under 35 U.S.C. § 112, second paragraph as indefinite. Claims 1-10, 13, 15, 16, 19, 20, and 23 were rejected under 35 U.S.C. § 102(b) as being anticipated by Kuntzburger et al. (US 5,547,550). Claims 14, 21, and 22 were rejected under 35 U.S.C. 102 (b) as anticipated by or, in the alternative, under 35 U.S.C. 103 (a) as obvious over Kuntzburger '550. Claims 11 and 12 were rejected under 35 U.S.C. 103 (a) as being unpatentable over Kuntzburger '550 in view of Bachot et al. (US 4,743,349). Claims 17 and 18 were rejected under 35 U.S.C. 103 (a) as being unpatentable over Kuntzburger '550 in view of Denton et al. (US 6,042,958).

Objection to the Specification

In response to the Examiner's requirement to add the abstract of disclosure, the applicants have added an abstract of disclosure accordingly. Therefore, the applicants believe the application is in compliance with the rules and submit that this objection has been overcome. Withdrawal of this objection is respectfully requested.

Rejection Under 35 U.S.C. § 112, second paragraph

Claims 6, 7, 8, and 23 stand rejected under 35 U.S.C. § 112, second paragraph as indefinite for failure to particularly point out and distinctly claim the subject matter the applicants regard as the invention. Specifically, the Examiner noted that claims 6, 7, and 8 use the term "w/w" and required that the term be clarified in

each of the claims. Claims 6, 7, and 8 have been cancelled herewith rendering this rejection moot with respect to these claims. In order to expedite prosecution, in newly added claims 28-30, this abbreviation has been replaced with the term "weight/weight." The applicants submit that this is a well-known abbreviation and term to mean the ratio of constituents by weight, as opposed to by volume or molar amount. Accordingly, this rejection has been overcome and no new matter has been added.

Claim 23 stands rejected by the Examiner because the phrase "said mixed amorphous silica fibres" lacks antecedent basis. Claim 23 has been amended in response to this rejection to recite merely "fibres," which is introduced in independent claim 17. Accordingly, the applicants respectfully request withdrawal of this rejection.

Rejection Under 35 U.S.C. § 102 (b)

Claims 1-10, 13, 15, 16, 19, 20, and 23 stand rejected under 35 U.S.C. § 102(b). Specifically, the Examiner indicates that the invention as set forth in those claims is anticipated by Kuntzburger '550. Claims 1-10, 15, and 16 have been cancelled, rendering the rejection moot with respect to these claims. For the reasons set forth below, the applicants respectfully submit that claims 13, 19, 20, and 23 are not anticipated by Kuntzburger '550.

With respect to claims 13, 19 and 20, the Examiner states that Kuntzburger '550 discloses a microporous diaphragm "created by depositing a suspension containing 100 parts by dry weight of asbestos fibers, 30 to 60 parts dry weight of silica-based derivatives and 20 to 60 parts by weight of fluorinated polymer." See page 3 of Office Action dated December 5, 2002 (citing column 3, lines 50-55). Further, the Examiner contends that "it is irrelevant whether the silica and fluorinated polymer is seen as a binder because the presence of a silica-based derivative and fluorinated polymer in the diaphragm is expected to exhibit the same properties." *Id.*

The applicants respectfully disagree that Kuntzburger '550 discloses all the features of the invention as claimed by claim 13. Claim 13 is directed to a composite membrane comprising a porous substrate of fibres and at least one ion-conducting polymer, characterized in that the porous substrate comprises fibres that are bound with both silica and a fluorinated hydrocarbon polymer. Kuntzburger '550 does not disclose a membrane that comprises an ion-conducting polymer but instead, is directed to a "fluorinated polymer." See column 5, lines 11-12. The applicants note that Kuntzburger '550 provides the following definition for the term "fluorinated polymer": "a

homopolymer or copolymer derived at least in part from an olefin monomer substituted with a fluorine atom or substituted by a combination of fluorine atoms and at least one atom of chlorine, bromine or iodine per monomer. Examples of fluorinated homopolymers or copolymers are polymers and copolymers derived from tetrafluoroethylene, hexafluoropropylene, chlorotrifluoroethylene and bromotrifluoroethylene." See column 5, lines 13-20. Further, Kuntzburger '550 does not disclose or even suggest that the "fluorinated polymer" contain functional groups which would provide the polymer with ionic conductivity. Moreover, the diaphragm disclosed in Kuntzburger '550 is directed to use in cells for the electrolysis of alkaline halide solutions. Therefore, there seems to be no reason why a person of ordinary skill in the art would desire to incorporate an ion-conducting polymer into the diaphragm disclosed in Kuntzburger '550. Accordingly, the applicants respectfully request withdrawal of this rejection of claim 13 and its dependent claims 19 and 20.

With respect to claim 23, the applicants note that claim 23 is dependent on claim 17, which has not been rejected under Section 102(b) under Kuntzburger '550. As a proper dependent claim is by definition more narrow than a claim from which it depends, the applicants presume that the rejection of claim 23 was inadvertent. Therefore, the applicants respectfully withdrawal of this rejection of claim 23.

Rejection Under 35 U.S.C. §§ 102/103 (a)

Claims 14, 21, and 22 stand rejected under 35 U.S.C. § 102 (b) as anticipated by or, in the alternative, under 35 U.S.C. § 103 (a) as obvious over Kuntzburger '550. These claims are all ultimately dependent on claim 13, which is believed to be patentable for the reasons discussed above. Nothing in the rejection of these dependent claims is responsive to the basis for distinction set forth above. Consequently, the applicants request withdrawal of this rejection.

Rejections Under 35 U.S.C. § 103 (a)

Claims 11 and 12 stand rejected under 35 U.S.C. 103 (a). Specifically, the Examiner states that the present invention is unpatentable over Kuntzburger '550 in view of Bachot '349. The Examiner indicates that it would have been obvious for one of ordinary skill in the art at the time the invention was made to use glass fibers "with diameters ranging between 0.1 μ m – 50 μ m" as disclosed by Bachot '349 in the membrane disclosed by Kuntzburger '550. Claims 11 and 12 have been cancelled

herewith, rendering the rejection moot with respect to these claims. Although newly added claim 34 recites this limitation, it is also dependent on claim 13.

Claims 17 and 18 stand rejected under 35 U.S.C. 103 (a). The Examiner contends that the present invention is unpatentable over Kuntzburger '550 in view of Denton '958. Specifically, the Examiner states that it would have been obvious for one of ordinary skill in the art at the time the invention was made to incorporate, in the process described in Kuntzburger '550, an "additional step of a nip roller coating the substrate with an ion-conducting polymeric material" so that additional surface characteristic are obtained as suggested by Denton '958.

Denton '958 discloses a process for the manufacture of a membrane wherein fibres are deposited in water thereby forming a slurry which can contain PTFE coated fibres and materials such as particulate silica. See column 5, lines 20-45. However, the applicants submit that Denton '958 does not suggest the process disclosed in claim 17, as amended herewith. For instance, Denton '958 discloses that fibres are coated with PTFE "prior to forming a substrate." This step of coating the fibres prior to the formation of a substrate is directly opposed to the process disclosed in the present invention wherein the fibres are coated with PTFE after a fibre network as been formed. In other words, the order in which silica and PTFE are added differs in Denton '958 from the present invention. Denton '958 states "particulate matter may be added to the fibre containing slurry." See column 6, lines 32-34. Denton '958 does not disclose that the particles should be added after the slurry has been deposited onto a mesh bed to form a fibre network, as required in claim 17 of the present invention.

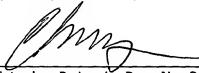
Further, Denton '958 does not suggest combining silica and a fluorinate polymer in a single dispersion and then applying such a combination to the fibre network in a single application. Moreover, the applicants submit that Kuntzburger '550 also fails to suggest that a dispersion containing both silica and a fluorinated polymer should be applied to a fibre network. Specifically, Kuntzburger '550 discloses that substrates are formed by combining fibres, silica-based derivatives and fluorinated polymer in an aqueous suspension and depositing the suspension by programmed vacuum filtration through a porous material. See column 3, lines 47-56. Accordingly, the applicants assert that the present invention is not obvious in light of the cited art.

For all of the reasons set forth above, the applicants assert that the present invention is not obvious in view of Kuntzburger '550 in combination with Denton '958. Accordingly, the applicants request withdrawal of this rejection.

CONCLUSION

The applicants submit that the pending claims are in condition for allowance. All grounds for objection or rejection have been overcome by the present amendment. Additionally, the newly added claims have full support in the specification and no new matter has been added. For all of these reasons, the applicants respectfully submit that the objections and rejections under 35 U.S.C. §§ 112, second paragraph, 102, and 103(a) should be withdrawn and favorable action is earnestly solicited.

Respectfully Submitted,



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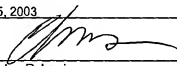
Enclosures: Version with markings to show changes made

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

5 IN THE CLAIMS:

Claims 1-12, 15 and 16 have been canceled.

17. (Twice amended) A process for the manufacture of a membrane,
comprising the steps of
- (i) forming a porous substrate [according to claim 16; and,
thereafter,] by a process comprising the steps of
- a. dispersing fibres in water to form a slurry;
- b. depositing the slurry onto a mesh bed to form a fibre network;
- c. drying and compacting the fibre network; and
- d. applying to the fibre network, before or after step (c), a dispersion of a binder comprising both silica and a fluorinated polymer; and thereafter,
- (ii) impregnating the fibre matrix substrate with a polymeric material
to produce a membrane.
23. (Once amended) A process according to claim 17, wherein [said mixed amorphous silica] the fibres are randomly oriented in said porous substrate.

Claims 24-24 have been added.

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ABSTRACT

A composite membrane comprises a porous substrate of fibres and at least one ion-conducting member, and the fibres are bound with a binder comprising both silica and a fluorinated hydrocarbon polymer. A process for the preparation of the membrane involves forming a porous substrate then impregnating the substrate with a polymeric material. In forming the substrate, a dispersion of a binder comprising silica and a fluorinated polymer is applied to a fibre network, either before or after the fibre network is dried.